TDK·Lambda

Specification Document
69338

Vega Smartplus Development Kit

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Mod:	Release/24546	25229/25329	27947	31744			
Date:	11.7.03	3.12.03	24.01.05	3.5.06			
Initials:	JM	JM	VP	KM			
Drawn:	Julia Morss - Manufacturing Information Systems						

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User RS232 Communications

User RS232 communication occurs between a single master in the form of the user's system and one or more slave Vega Smartplus units. The physical data format is compatible with RS232 (dependent on option fitted) at 9600 baud, 8 bits, 1 stop bit and no parity.

All data sent over the communications bus is grouped into messages. A message has the following format:
Length identifier byte (LEN), Unit identifier byte (UID), Module identifier byte (MID), Command identifier byte (CID), optional data bytes (DATA), and finally cyclic redundancy check byte (CRC).

LEN	UID	MID	CID	DATA	CRC

LEN
The length identifier is the number of bytes in the message including the LEN byte itself.

UID
Unit identifiers can be between $01 and $1F with UID $00 being reserved for broadcast messages. A Vega Smartplus will only respond to messages using its own UID.

MID
The module identifier determines which output module (or the system controller) responds to a message. Each module has an identifier stored in EEPROM, and will respond only to messages with a matching MID. Modules occupy MID numbers $01 to $08 with module 1 being the right most module in the unit (viewed from output end). The System controller is assigned an address of $1F.

CID/DATA
The command identifier (CID) identifies the purpose of the message and how the subsequent data is to be interpreted. The number of data bytes depends on the purpose of the command.
For commands with a MID not equal to zero, the CID is followed by a number of data bytes that is fixed and contains the data necessary for completion of the command.
If MID equals zero then the command is identified as a group command in which case the number of data bytes is increased by one.
This additional data byte contains a group identifier and is always the first byte following the CID. If the module has a group identifier (GID), stored in eeprom, that is the same as the transmitted GID the module will action the command but no response will be returned.

CRC
The CRC is calculated using the 8 bit polynomial $x^2 + x^1 + x^0$, (i.e. 7 in decimal) with a starting value of zero. See the code example below as guide to the calculations involved in generating a CRC for a message to be transmitted.

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CRC code example (Visual Basic)

```
Public Function CRC(OldCRC As Integer, ByVal Char As Integer) As Integer

   Dim n As Integer
   CRC = OldCRC

   For n = 0 To 7                          'Loop 8 times
   CRC = CRC * 2                           'Left shift CRC
   Char = Char * 2                         'Left shift Char
   If ((Char And 256) = 256) Then          'If Carry is set for Char
   CRC = CRC + 1                           'Increment CRC
   End If
   If ((CRC And 256) = 256) Then           'If Carry is set for CRC
   CRC = CRC Xor 7                         XOR CRC with Polynomial
    End If
    CRC = CRC And 255
    Char = Char And 255
    Next                                   Goto loop start (FOR)

End Function
```

Encoding CRC bytes
To generate a CRC byte, call this function passing the first two bytes of the message as OldCRC and Char respectively. This will result in an initial value for CRC. For each additional byte in the message, call the same function passing the previous CRC result as OldCRC and the data byte as Char. When this has been done for all the bytes within the message call the function once more using a value of zero as Char. The value of CRC now will be the value of the byte to append to the message.

Decoding CRC bytes
For checking a CRC byte within a received message, the same function can be used. Call this function passing the first two bytes of the message as OldCRC and Char respectively. This will result in a value for CRC. For each additional byte in the message, call this function passing the previous CRC result as OldCRC and the data byte as Char. When this has been done for all the bytes within the message, the result should be zero. If the final value of CRC returned from the function is not zero then an error has occurred corrupting the message.

Error detection
Communication on the bus is always transactional: the master initiates communication by sending a message to a slave, and then waits for a reply before sending subsequent messages. In the event of an incorrect or corrupted message being received by a slave, the message is discarded, an error code generated and a reply is returned. The response to a message from the master normally has the same CID as the original message, but in the case of an error the message LEN, MID, $18, Error code, CRC is returned. The error codes can be found on page 223.

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Module Controller Commands

This section addresses the commands that are for the control and monitoring of specific output modules. To address multiple modules simultaneously, the group commands can be used where appropriate.

Output status commands

01d Output On/Off

Message: LEN, UID, MID, 01d, OnOff, CRC
Reply: LEN, UID, MID, 01d, State, CRC

Group Command :
Message: LEN, UID, 00d, 01d, GID, OnOff, CRC
Reply: No Reply is Returned

The output On/Off message, in conjunction with the On/Off input, turns the output of a module on or off. If OnOff is 31d and the On/Off input is on, then the module output is turned on. Any other value turns the module output off regardless of the state of the On/Off input. Once the output has been turned off by the On/Off command, it can be turned back on by taking the On/Off input into the off state and then back to the on state.

The reply from the On/Off command contains the actual state of the module output. If State is 31d then the module output is turned on. If it is 0d then the output is off. The On/Off command will fail to turn the module output on if the start up delay has not elapsed or if it is overridden by the on/off input.

If a module receives an On/Off command with a MID of zero then no response is generated. This allows multiple modules to be controlled without the responses generating bus collisions.

09d Get Output State

Message: LEN, UID, MID, 09d, CRC
Reply: LEN, UID, MID, 09d, On/Off_State, CRC

Group Command: *Not Valid*

The get output state command returns a value indicating whether a module has its output turned ON or OFF, the status of the on/off input, and the status of the module good output.

Bit	Meaning
0	Module Output State 1 = Output On 0 = Output Off
1	On/Off input state 1 = Input Active 0 = Input Not Active
2	Module good output state 1 = Module Good 0 = Not Module Good

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15d Get Module Status

Message: LEN, UID, MID, 15d, CRC
Reply: LEN, UID, MID, 15d, Status, CRC

Group Command: *Not Valid*

The get module status command returns the module output status information required by the primary controller. The status byte is defined as follows:

Bit	Meaning
0	Module Output State 1 = Output On 0 = Output Off
1	On/Off input state 1 = Active (high) 0 = Not Active (low)
2	Module good output state 1 = Module good 0 = Not module good
3	Current limit state 1 = Module is in current limit 0 = Module is not in current limit
4	Reserved

The on/off input state bit is not effected by the setting of the on/off polarity bit in EEPROM. The on/off bit is set when the on/off input is high and cleared when it is low.

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Voltage and current monitoring/control commands

02d Read Output Voltage

Message: LEN, UID, MID, 02d, CRC
Reply: LEN, UID, MID, 02d, Voltage Low, Voltage High, CRC

Group Command: Not Valid

The read output voltage message returns the output voltage of a module encoded as a 10-Bit number.
For scale factors, reference document 69363.

03d Read Output Current

Message: LEN, UID, MID, 03d, CRC
Reply: LEN, UID, MID, 03d, Current Low, Current High, CR

Group Command: Not Valid

The Read Output Current message returns the output current of a module encoded as a 10-Bit number.
For scale factors, reference document 69363.

07d Set Output Voltage

Message: LEN, UID, MID, 07d, Voltage Low, Voltage High, CRC
Reply: LEN, UID, MID, 07d, CRC

Group Command:

Message: LEN, UID, 00d, 07d, GID, Voltage Low, Voltage High, CRC
Reply: No Reply is returned

The Set Output Voltage command sets the output voltage of the module addressed. If the module output is disabled the voltage will not change until it is turned back on with the output on/off command.
For scale factors, reference document 69363.

08d Read Analogue Input

Message: LEN, UID, MID, 08d, CRC
Reply: LEN, UID, MID, 08d, Voltage Low, Voltage High, CRC

Group Command: Not Valid

The read output voltage message returns the remote programming voltage of a module encoded as a 10-Bit number.

In voltage programming mode a value of 1023 corresponds to an input voltage of 5V (with respect to 0V).

$$X = \frac{1024 V_{Prog}}{5}$$

Where X is the 10-Bit value returned by the command.

For resistance programming, 0W corresponds to 5V. See application notes for typical linearity curves.

10d Get Voltage Set-point

Message: LEN, UID, MID, 10d, CRC
Reply: LEN, UID, MID, 10d, Set-point_Low, Set-point_High, Source, CRC

Group Command: *Not Valid*

The get voltage set point command returns a value indicating the output voltage set point of a module, encoded as a 10-bit number. The set point is determined by the highest out of the external analogue programming input, and received RS232 programming commands.

The Source parameter returned in the reply indicates which input is currently controlling the module output according to:

Value	Meaning
00_d	Module potentiometer
01_d	External analogue input
02_d	RS232 Set Output Voltage command

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EEPROM commands

04d Read one byte of EEPROM

Message: LEN, UID, MID, 04d, Address, CRC
Reply: LEN, UID, MID, 04d, Data, CRC

Group Command: *Not Valid*

The Read EEPROM command allows data to be read from 256 bytes of EEPROM memory on the option board.
Some of these locations contain calibration or configuration information, whilst the rest are free for serial number storage or future use. See the Module EEPROM memory map for details.

05d Write one byte of EEPROM

Message: LEN, UID, MID, 05d, Address,Data, CRC
Reply: LEN, UID, MID, 05d, CRC

Group Command:

Message: LEN, UID, 00d, 05d, GID, Address,Data, CRC
Reply: No Reply is Returned

The Write EEPROM command allows data to be written to certain areas EEPROM memory on the option board. Write access to addresses higher than 200d will be denied. Any write attempt to addresses above 200d will fail, causing an error message to be returned. See the Module EEPROM memory map for details.

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19d Read two bytes of EEPROM

Message: LEN, UID, MID, 19d, Address, CRC
Reply: LEN, UID, MID, 19d, DataLow, DataHigh,CRC

Group Command: Not Valid

The Read EEPROM command allows two bytes of data to be read from 255 bytes of EEPROM memory on the option board. Some of these locations contain calibration or configuration information, whilst the rest are free for serial number storage or future use. See the EEPROM memory map for details.

20d Write two bytes of EEPROM

Message: LEN, UID, MID, 20d, Address, DataLow, DataHigh,CRC
Reply: LEN, UID, MID, 20d, Status, CRC

Group Command:

Message: LEN, UID, 00d, 20d, GID, Address, DataLow, DataHigh,CRC
Reply: No Reply is Returned

The Write two bytes of EEPROM command allows data to be written to two consecutive addresses within certain areas EEPROM memory on the option board. The address specified in the command should be the lower of the two consecutive target addresses.
Write access to addresses higher than 200d will be denied. Any write attempt to addresses above 200d will fail, causing an error message to be returned. See the Module EEPROM memory map for details.

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Grouping
Grouping provides the ability to communicate with more than one output at a time. This is especially useful with outputs that are paralleled or connected in series. All single modules by default have the Group ID of $01, and outputs that are series or parallel will have Group ID of $02 for the first one and $03 for the second, where applicable. Groups can span units on the same communications bus, however to communicate with groups of this type a Global command must be used (one with a Unit ID of 00) and no reply will be sent.
Set Group Output State
Message: LEN, UID, $00, $01, GID, OutputStateData, CRC
Reply: LEN, UID, $00, $01, CRC
This command will turn ON/OFF the outputs of the specified Group (GID). The ON/OFF pin on the module will overide this command if the pin is inhibiting the module, the module will remain OFF regardless of the command. If OutputStateData is $1F and the modules in the group are enabled then the output is turned on. Any other value will turn the module off, regardless of the enable/inhibit pin.
SetGroupVoltageSetpoint:
Message: LEN, UID, $00, $07, GID, VoltageDataLow, VoltageDataHigh, CRC
Reply: LEN, UID, $00, $07, CRC
The command will set the immediate voltage of all the modules in the group. This command should be used for temporary voltage setting that the user does not want at system initialisation. The output voltage of the module will be set to whichever programming voltage is highest out of the analog programming pin, the on board adjustment potentiometer, or the communications programmed value. The command will respond with an echo.
For scale factors, reference document 69363
Set Group ID:
Message: LEN, UID, MID, $05, Address, GroupID, CRC
Reply: LEN, UID, MID, $05, CRC
This command will program a single EEPROM memory location in the module controller, if Address = $0F, this will set the Group ID of the selected module. The GroupID is an Integer from 00d to 31d ($00 to $1F). See the Module EEPROM memory map for details.
Get Group ID:
Message: LEN, UID, MID, $04, Address, CRC
Reply: LEN, UID, MID, $04, GroupID, CRC
This command will read a single EEPROM memory location in the module controller, if Address = $0F, this will retrieve the GroupID. See the Module EEPROM memory map for details.

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24d Error

Reply: *LEN, UID, MID, 24d, Error Code, CRC*

This command is used as a reply if there is an error in receiving a message, it is transmitted as soon as the error is identified to reduce time lost in waiting for the end of message before replying. See error code table on page 26 for details.

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Module Controller EEPROM Locations

To save on command set size, and hence command handlers, many configurable parameters are adjusted by writing directly to EEPROM.

EEPROM Locations		Description	Notes
0	0x00	Not Used	Do not use this location
1	0x01	Default voltage set-point	
2	0x02	Default voltage set-point	
3	0x03	Start-up delay	
4	0x04	Start-up delay	
5	0x05	Module good upper limit	
6	0x06	Module good upper limit	
7	0x07	Module good lower limit	
8	0x08	Module good lower limit	
9	0x09	Current limit	
10	0x0A	Current limit	
11	0x0B	Current limit activation time	
12	0x0C	Current limit activation time	
13	0x0D	Current limit reset time	
14	0x0E	Current limit reset time	
15	0x0F	Group ID	
16	0x10	Mode	
..			Unused
200	0xC8	Module ID	Factory Programmed
201	0xC9	Calibration data	Factory Programmed
202	0xCA	Calibration data	Factory Programmed
203	0xCB	Calibration data	Factory Programmed
204	0xCC	Module type identifier	Factory Programmed
205	0xCD	Module hardware/software version number	Factory Programmed
206	0xCE	Module serial number	Factory Programmed
207	0xCF	Module serial number	Factory Programmed
208	0xD0	Module serial number	Factory Programmed
209	0xD1	Module serial number	Factory Programmed
210	0xD2	Module serial number	Factory Programmed
211		Calibration data	Factory Programmed
...		Calibration data	Factory Programmed
218		Calibration data	Factory Programmed
..			
511	0x1FF		

All numbers are stored in low-ending format (least significant byte in lowest location). Locations 0xC8 and above are locked for protection and customers will not be able to write to this area.

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$01 - $02 Default Voltage Set-point

Length	10 bit
Type	Unsigned

The default voltage set point determines the programmed output voltage of the module at start up. For scale factors, reference document 69363.

$03 - $04 Start-up Delay

Length	16 bit
Type	Unsigned

The start-up time determines the delay in ms after the option board initialise before the module output is enabled. The time taken for the option board to initialise includes the time taken for the converter to start, the time for the module auxiliary to start, and reset delay of the microcontroller on the option board. Start-up delay can be used to sequence the start-up of different modules in the same unit.

$05 - $06 Module Good Upper Limit

Length	10 bit
Type	Unsigned

The module good upper limit sets the fixed maximum limit for the module good signal. If this is set to 00d, then the upper limit is ignored. For scale factors, reference document 69363.

$07 - $08 Module Good Lower Limit

Length	10 bit
Type	Unsigned

The module good lower limit sets the fixed minimum limit for the module good signal. If this is set to 00d, then the lower limit is ignored. For scale factors, reference document 69363.

$09 - $0A Current Limit

Length	10 bit
Type	Unsigned

The current limit decides the point at which the hiccup or latching current limit become active. When hiccup current limit is selected (see page 15 for current limit modes), if the module output current exceeds the current limit for longer than the activation time (see below), then the output is disabled. After the reset time (see below) has elapsed, the output is enabled.
Latching current limit is the same as hiccup current limit except that the output remains off.

$0B - $0C Current Limit Activation Time

Length	16 bit
Type	Unsigned

Current limit activation time in milliseconds. See current limit above.

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$0D - $0E Current Limit Reset Time

Length	16 bit
Type	Unsigned

Current limit reset time in milliseconds. See current limit above.

$0F Group ID

Length	5 bit
Type	Unsigned

The group ID controls which modules react to a group command. Only modules with GIDs that match the one specified in the command will react.

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$10 Mode

Length	6 bit
Type	Bit-Field

The current limit mode determines if the hiccup or latching current limits are active. The mode is set by the lowest two bits. The remaining bits determine the analogue programming mode, polarity of the On/Off and default On/Off state of the module.

Bits 0..1 - Current Limit Mode

Bits1&0	Mode
00	Normal
01	Latching current limit
10	Hiccup current limit
11	Current sharing

Bit 2 - Current limit reset enable (MODE_RSTE)
If set (one), then latching current limit can be reset by the on/off input or a software on/off command command.
If cleared (zero) then latching current limit will remain latched until power to the unit is cycled.
When using the on/off input for resetting the current limit, the polarity of the input is determined by the on/off polarity bit stored in EEPROM. To reset the current limit the on/off input must be taken into the off state for at least 5ms before returning to the on state.

For 'no current limit' or 'hiccup current limit' modes, this bit has no function

Bit 3 - Analogue programming mode (MODE_APM)
If set (one) then the external analogue programming input is configured for voltage programming. If cleared (zero) then it is configured for resistance programming.

Bit 4 - On/off polarity (MODE_POL)
If set (one) the on/off input is configured as an active-high inhibit.
If cleared (zero) the on/off input is configured as an active-high enable.

Bit 5 - Default On/Off state (MODE_DPS)
If set (one) then the module output is enabled at start up. I clear (zero) the output is disabled until an RS232 on command is received or the on/off input is cycled.

In the all modes, the hardware current limit on the module is still active.

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$C8 Module ID

Length	8 bit
Type	Unsigned

The module ID is an 8-bit number that identifies an option board on a communications network. All option boards on a network must have a unique module ID.

$CC Module Type Identifier

Length	8 bit
Type	Unsigned

The module type identifier uniquely identifies to which module type the secondary option is fitted. The identifier can be used in conjunction with document 69363, to get the module's voltage and current capabilities as well as the current and voltage scaling factors.

$CD Module Hardware/Software Version Number

Length	8 bit
Type	Unsigned

The version is stored as a two-digit number comprising of a three bit major version and a five bit minor version. The major version occupies the upper three bits of the EEPROM location and applies to the option board hardware. The minor version occupies the lower five bits and applies to the option board software.

$CE - $D2 Module Serial Number

Length	5 bytes
Type	BCD

The serial number block contains the 10 digit numeric serial number for the module that the secondary option is fitted to. Each digit is BCD encoded and stored two to a byte. The leftmost digit of the serial number is stored in the lower nibble of location $D2

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System Controller Commands

This section addresses the commands that are for the control and monitoring of the global functions of the power supply.

Output status commands

14d Set Global Output State:

Message: LEN, UID, 31d, 14d, GlobalOutputStateByte, CRC
Reply: LEN, UID, 31d, 14d, CRC

This command is used to set the value of Global Output State byte. This enables two features:

1) Global polarity bit – the value of the global polarity bit determines the function of the global inhibit/ enable pins. When the bit is set, the input behaves like an enable function; the power supply in normally off, requiring an external signal to turn the power supply on.
If the bit is cleared, the input behaves like an inhibit function; the power supply is normally on, requiring an external signal to turn the power supply off.

2) Global state bit – the value of the global state bit determines if the global inhibit is activated or not. This will turn the power supply on or off. The global ON/OFF input on the option board can over-ride this command. If the global ON/OFF input disables the power supply, it will remain off regard-less of the command.

Bit #	Description	Meaning
0	Global Polarity	1 - Normal (Logic “1” Enable), 0 - Inverted (Logic “1” Inhibit)
1	Global State	1- On, 0 - Off
2		
3		
4		
5		
6		
7		

21d Get Global State:

Message: LEN, UID, 31d, 21d, CRC
Reply: LEN, UID, 31d, 21d, GlobalOutputStatusByte, CRC

This command returns the Global Output State Byte from the system controller.

Bit #	Description	Meaning
0	Global Polarity	1 - Normal (Logic "1" Enable), 0 - Inverted (Logic "1" Inhibit)
1	Global State	1- On, 0 - Off
2		
3		
4		
5		
6		
7		

09d Get Output State:

Message: LEN, UID, 31d, 09d, CRC
Reply: LEN, UID, 31d, 09d, ModuleOutputStateByte, CRC

The get output state command returns the Module Output State Byte indicating which module has its output turned ON or OFF. Addresses where a module with Smartplus option is not fitted will indicate a bit value of 0.

Bit #	*Description*	*Meaning*
0	Module 1	1- Output On, 0 - Output Off
1	Module 2	1- Output On, 0 - Output Off
2	Module 3	1- Output On, 0 - Output Off
3	Module 4	1- Output On, 0 - Output Off
4	Module 5	1- Output On, 0 - Output Off
5	Module 6	1- Output On, 0 - Output Off
6	Module 7	1- Output On, 0 - Output Off
7	Module 8	1- Output On, 0 - Output Off

11d Get Module Good Status Byte:

Message: LEN, UID, 31d, 11d, CRC
Reply: LEN, UID, 31d, 11d, ModuleGoodStatusByte, CRC

This command reports the result of the Module Good signals. Addresses where a module with Smartplus option is not fitted will indicate a bit value of 0.

Bit #	*Description*	*Meaning*
0	Module 1 - good	1 - Good, 0 - Error
1	Module 2 - good	1 - Good, 0 - Error
2	Module 3 - good	1 - Good, 0 - Error
3	Module 4 - good	1 - Good, 0 - Error
4	Module 5 - good	1 - Good, 0 - Error
5	Module 6 - good	1 - Good, 0 - Error
6	Module 7 - good	1 - Good, 0 - Error
7	Module 8 - good	1 - Good, 0 - Error

12d Get Global Status Byte:

Message: LEN, UID, 31d, 12d, CRC
Reply: LEN, UID, 31d, 12d, GlobalStatusByte, CRC

This command returns the Global Status Byte. This provides the following information:

Bit #	*Description*	*Meaning*
0	OT Status	1 - Good, 0 - Fail
1	Fan OK Status	1 - Good, 0 - Fail
2	AC Status	1 - Good, 0 - Fail
3	Global DC Good Status	1 - Good, 0 - Fail
4	Current Limit Status	1 - Good, 0 - Fail
5	Not used	N/A
6	OVP Status	1 - Good, 0 - Fail
7	Fan Warning Status	1 - Good, 0 - Warning

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EEPROM Commands

04d Read one byte of EEPROM

Message: LEN, UID, 31d, 04d, Address, CRC
Reply: LEN, UID, 31d, 04d, Data, CRC

The Read EEPROM command allows data to be read from the 512 bytes of EEPROM memory on the option board.
Some of these locations contain calibration or configuration information, whilst the rest are free for serial number storage or future use. See the System Controller EEPROM memory map for details.

05d Write one byte of EEPROM

Message: LEN, UID, 31d, 05d, Address, Data, CRC
Reply: LEN, UID, 31d, 05d, CRC

The Write EEPROM command allows data to be written to certain areas EEPROM memory on the option board. Write access to addresses higher than 200d will be denied. Any write attempt to addresses above 200d will fail, causing an error message to be returned. See the System Controller EEPROM memory map for details.

19d Read two bytes of EEPROM:

Message: LEN, UID, MID, 19d, Address, CRC
Reply: LEN, UID, MID, 19d, DataLow, DataHigh,CRC

The Read EEPROM command allows two bytes of data to be read from the 512 bytes of EEPROM memory on the option board. Some of these locations contain calibration or configuration information, whilst the rest are free for serial number storage or future use. See the EEPROM memory map for details.

20d Write two bytes of EEPROM:

Message: LEN, UID, MID, 20d, Address, DataLow, DataHigh,CRC
Reply: LEN, MID, 20d, Status, CRC

Group Command:

Message: LEN, UID, 00d, 20d, GID, Address, DataLow, DataHigh,CRC
Reply: No Reply is Returned

The Write two bytes of EEPROM command allows data to be written to two consecutive addresses within certain areas EEPROM memory on the option board. The address specified in the command should be the lower of the two consecutive target addresses.
Write access to addresses higher than 200d will be denied. Any write attempt to addresses above 200d will fail, causing an error message to be returned. See the Module EEPROM memory map for details.

Issue:	1	2	3	4			
Mod:	Release/24546	25229/25329	27947	31744			
Date:	11.7.03	3.12.03	24.01.05	3.5.06			
Initials:	JM	JM	VP	KM			
Drawn:	Julia Morss - Manufacturing Information Systems						

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24d Error:

Reply: LEN, UID, 31d, 24d, ErrorCode, CRC

This command is used as reply if there is an error in receiving a message. The Error message is transmitted as soon as the error is identified.
See the Error Code List on page 22 for more details.

Issue:	1	2	3	4			
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System Controller EEPROM Locations

EEPROM Locations		*Description*	*Notes*
0	0x00	Not Used	Do not use this location
1	0x01	Default System Signal Polarity	
2	0x02	Not used	
3	0x03	Not used	
4	0x04	Default global ON/OFF byte & Global Polarity	
5	0x05	Not used	
6	0x06	Not used	
..		Not used	
200	0xC8	Modules present byte	Factory Programmed location
201	0xC9	Hour Meter	Read only
202	0xCA	Hour Meter	Read only
203	0xCB	Hour Meter	Read only
204	0xCC	Unit hardware/software version number	Factory Programmed location
205	0xCD	Unit serial number	Factory Programmed location
206	0xCE	Unit serial number	Factory Programmed location
207	0xCF	Unit serial number	Factory Programmed location
208	0xD0	Unit serial number	Factory Programmed location
209	0xD1	Unit serial number	Factory Programmed location
210	0xD2		
..			
511	0x1FF		

Locations 0xC8 and above are locked for protection and customers will not be able to write to this area.

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Bit #	Description	Meaning
0	Fan Fail Signal	1 - Normal High, 0 - Normal Low
1	Global DC Good Signal	1 - Normal High, 0 - Normal Low
2		
3	Over Temp. Signal	1 - Normal High, 0 - Normal Low
4		
5		
6		
7		

$01 Default System Signal Polarity Byte

$04 Default Global ON/OFF Byte & Global Polarity

This byte holds the default Global ON/OFF polarity and the default Global ON/OFF state

Bit #	Description	Meaning
0	Default Global On/Off Polarity	1 - Normal (Inhibit) 0 - Inverted (Enable)
1	Default Global On/Off State	1-On 0 - Off
2		
3		
4		
5		
6		
7		

When bit 0 is clear, the hardware global on/off function behaves as an “inhibit function”. Thus, a signal is required to turn the power supply off.
When bit 0 is set, the hardware global on/off function behaves as an “enable function”. In this case, a signal is required to turn the power supply on.

$07 Unit ID

Length	5 bit
Type	Unsigned

The unit ID is a 5 bit number that identifies the power supply on the communications Bus. All power supplies on the same communications Bus must have a unique unit ID. Factory default unit ID=0x01. Do not set UID = 0.

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Drawn:	Julia Morss - Manufacturing Information Systems						

$C8 Modules present Byte

This byte identifies at power up which power module is present in the internal bus.

Bit #	*Description*	*Meaning*
0	Module 1	1 - Present, 0 - Not Present
1	Module 2	1 - Present, 0 - Not Present
2	Module 3	1 - Present, 0 - Not Present
3	Module 4	1 - Present, 0 - Not Present
4	Module 5	1 - Present, 0 - Not Present
5	Module 6	1 - Present, 0 - Not Present
6	Module 7	1 - Present, 0 - Not Present
7	Module 8	1 - Present, 0 - Not Present

$C9 - $CB Hour Meter

The Hour meter takes up 3 Bytes in the EEPROM and is stored with left most digit in the lowest memory location.

0xCC Unit Hardware/Software Version Number

The version is stored as a two digit number comprising of a three bit major version and a five bit minor version. The major version occupies the upper three bits of the EEPROM location and applies to the option board hardware (H). The minor version occupies the lower five bits and applies to the option board software (S).

Example:

A version number of 1.3 would be stored as 23h (001 00011b), and corresponds to a hardware version 1 running software version 3.

$CD - $D1 Unit Serial Number

The unit serial number is a 10-digit number.
The Serial # takes five Bytes in the EEPROM and is stored with left most digit in the lowest memory location.
Ex: Serial # “1234567890” would be represented by:

Base +00	21h
+01	43h
+02	65h
+03	87h
+04	09h

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Scale Factors

See document 69363 for scale factors.

To convert from a voltage or current to the internal representation used on an option board, multiply the voltage or current value by the scale factors listed in document 69363. For example, 3.2V on a B2 module would correspond to 3.2 x102.3 =327. So, to program a B2 module to 3.2V, the Set Output Voltage command would be sent with a value of 327d.

When reading voltage or current values from a module, divide the number obtained from the module by the scale factor. For example if a B2 module returned 500d is the result of a Read Output Current command, it could be converted by dividing by 27.171 to give 18.40A.

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Vega Error Codes

For Module CPU

	Error Code	Error Description
0	0x00	Error
1	0x01	Unrecognised command
2	0x02	Bad CRC
3	0x03	Buffer Overrun
4	0x04	Framing Error
5	0x05	Invalid command
6	0x06	Timeout
7	0x07	Trailing garbage error
8	0x08	
9	0x09	
10	0x0A	
11	0x0B	EEPROM write 8 fail
12	0x0C	EEPROM write 16 fail
13	0x0D	EEPROM lock fail
14	0x0E	
15	0x0F	
16	0x10	

For System CPU

	Error code	Error description
101	0x65	Wrong Message
102	0x66	Wrong Group Msg
103	0x67	Wrong Module
104	0x68	Wrong Cmd For Sc
105	0x69	Wrong Data Byte
106	0x6A	UART Receive CRC Error
107	0x6B	Module Time Out
108	0x6C	Wrong Module CID
109	0x6D	Wrong Module MID
110	0x6E	EEPROM Write Fail
111	0x6F	Module not Present

For Buffer CPU

	Error code	Error description
201	0xC9	Software UART Buffer Overrun Error
202	0xCA	Software UART Receive CRC Error
203	0xCB	BufferCPU Timeout Error
204	0xCC	
205	0xCD	Hardware UART Buffer Overrun Error
206	0xCE	Hardware UART Receive CRC Error

Issue:	1	2	3	4			
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Initials:	JM	JM	VP	KM			
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